Bacterial Physiology & Pathogenesis, 7.5 ECTS

Course Time: 3rd October, 2018 – 5th November, 2018

Location: Lectures: Astrid Fagraeus, room A103, Building A in the Norrlands University Hospital (NUS) area

Practical (wet-lab): “Yellow laboratory”, room A109, NUS Building A

Practical (dry-lab): “Computer laboratory”, room Thymine / Uracil (6K-148), Building 6K in the Department of Molecular Biology

Literature: For example:
2. Online resource: Microbiology and Immunology Online at http://pathmicro.med.sc.edu/book/bact-sta.html
4. Other material provided by the Department.

Examination: Monday, November 5th, 9.00-13.00, Lecture hall N320, Naturvetarhuset

Re-examination: Monday, December 10th, 16.00-20.00, Östra Paviljongen

Course Leader: Matthew FRANCIS
Phone: 785 6752; Email: matthew.francis@umu.se

Administrator: Ingela NILSSON
Phone: 785 2869; Email: ingela.nilsson@umu.se
LABORATORY ASSISTANTS: Firoj MAHMUD (FMa)  
Email: firoj.mahmud@umu.se  
[firoj.mahmud.umu@analys.urkund.se (Lab examination II only)]

Salah FARAG (SFa)  
Email: farag.salah.ibrahim@umu.se  
[farag.salah.ibrahim.umu@analys.urkund.se (Lab examination II only)]

LABORATORY SESSIONS: (Strictly Mandatory)  
“Genetic and physiological characterization of enriched bacterial isolates” (FMa, SFa)

LABORATORY EXAMINATION: (Strictly Mandatory)  
- White-board presentation of the laboratory project divided into introduction, goals, methods, results and discussion; a group-based exercise! (Lab examination I)
- Laboratory “Quiz” (short answer and multiple choice questions); a group-based exercise! (Lab examination II)  
  Answers are to be submitted electronically to the Laboratory assistants’ (FMa or SFa) “Urkund” email addresses.
- In addition, your own personal laboratory notebook MUST be utilized on every single laboratory session. It is also your responsibility to have this CERTIFIED (signed and dated) by a lab assistant (FMa, SFa) at the conclusion of EVERY laboratory session. You could think of this exercise as examination III.

Note: You must obtain a grade ‘G’ to gain credit for this course module.

LECTURERS  
Victoria SHINGLER (VSh) victoria.shingler@umu.se  
Jörgen JOHANSSON (JJo): jorgen.johansson@umu.se  
Sun NYUNT WAI (SNw) sun.nyunt.wai@umu.se  
Matthew FRANCIS (MFr) matthew.francis@umu.se

LECTURER THEMES  
Principles and Applications of Bacterial Diversity  
- Bacterial Diversity (Lecture 1; MFr)  
- Extreme Environments (Lecture 2; SNw)  
- Bioenergetics (Lecture 3; MFr)

General Principles of Bacterial Regulatory Networks  
- Transcriptional Regulation (Lecture 4; VSh)  
- Signal Transduction by Two-Component Regulatory Systems (Lecture 5; VSh)  
- Post-transcriptional Regulation (Lecture 6; JJo)  
- Translational Regulation (Lecture 7; JJo)  
- Post-translational Regulation (Lecture 8; SNw)

Important Physiological Processes  
- Bacterial Stress Responses – Global Regulation (Lecture 9; VSh)  
- Solute Transport (Lecture 10; MFr)  
- Protein Secretion Systems (Lecture 11; MFr)  
- Bacterial Motion (Lecture 12; VSh)
➢ Prokaryotic Differentiation and Development (Lecture 13; SNw)

Bacterial Virulence Strategies
➢ Bacterial Pathogenesis I – pathogen evolution and the study of bacterial pathogens (Lecture 14; MFr)
➢ Bacterial Pathogenesis II – the infection process and virulence mechanisms (Lecture 15; MFr)
➢ Bacterial Pathogenesis III – bacterial responses to the host cell (regulating virulence) (Lecture 16; MFr)
➢ Bacterial Pathogenesis IV – treatment and prevention (Lecture 17; MFr)

TUTORIALS
Two tutorial sessions have been planned.

This time is allocated for YOU to address YOUR questions to the course leader and/or other participating lecturers. Make full use of this available time by ensuring your advanced preparation (i.e.: go through the lecture material before the tutorial).

Remember that:

a) all group members must attend all laboratory orientation/introductory sessions and the full duration of every experimental session
b) any absence, even for a short period, must be first reported to, and/or agreed upon by the Course assistant in charge (i.e. you CAN NOT come and go when you please)
c) both group members are expected to participate equally in all laboratory examinations and to maintain their own individual laboratory notebook that is to be certified by a lab assistant at the conclusion of each session

Please use any “free” time wisely!

Important Information:

i. Lab equipment is very expensive – use with extreme care and concentration. If you are unsure as to how to properly use a particular piece of lab equipment, before use ask one of the lab assistants.

ii. In the labs, you will be potentially working with pathogenic bacteria deserving of your respect. Follow all advice given to you about safety precautions.

iii. Treat your lab assistants with respect; it is not an easy job and they do have more laboratory experience than you.

iv. To be allowed to sit the exam, all laboratory examinations must be completed and/or submitted.

During a fire alarm, evacuate promptly to the clearing, a safe distance from the outside entrance to building 6L.
**Week 40**  
(working week 1)

**Thursday (04-10-2018)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>09.00 – 09.45</td>
<td>Course orientation &amp; Roll-call (MFr)</td>
<td>Astrid Fagraeus (A103)</td>
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<tr>
<td>10.00 – 12.00</td>
<td>Lecture 1: “Bacterial Diversity” (MFr)</td>
<td>Astrid Fagraeus (A103)</td>
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<td>Lunch</td>
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<tr>
<td>13.00 – 14.00</td>
<td>Lecture 2: “Extreme Environments” (SNw)</td>
<td>Astrid Fagraeus (A103)</td>
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**Friday (05-10-2018)**

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<tr>
<th>Time</th>
<th>Activity</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>10.00 – 10.45</td>
<td>Laboratory Safety (MFr; FMa; SFa)</td>
<td>Astrid Fagraeus (A103)</td>
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<tr>
<td>11.00 – 12.00</td>
<td>Introduction to the laboratory course</td>
<td>Astrid Fagraeus (A103)</td>
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<td>Information concerning laboratory notebook</td>
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<td>(examination III)</td>
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<td>(MFr; FMa; SFa)</td>
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<td>Lunch</td>
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<td>13.00 – 16.30</td>
<td>Laboration: “Day 1 – dry lab”</td>
<td>Computer suite (Thymine / Uracil)</td>
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<td>Sequence data analysis</td>
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<td>(bacterial identity/clustal W analysis)</td>
<td>(FMa; SFa)</td>
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<td>Remember to use your laboratory notebook!</td>
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Week 41

(working week 2)

Monday (08-10-2018)

Literature study of sequenced bacteria; preparation for experimental plan discussions

Lunch

14.00 – 16.30  Lecture 3:  “Bioenergetics”  (MFr)  Astrid Fagraeus (A103)

Tuesday (09-10-2018)

Literature study of sequenced bacteria; preparation for experimental plan discussions

Lunch

13.00 – 15.00  Lecture 4:  “Transcriptional Regulation”  (VSh)  Astrid Fagraeus (A103)

Wednesday (10-10-2018)

Literature study of sequenced bacteria; preparation for experimental plan discussions

Lunch

13.00 – 14.30  Lecture 5:  “Signal Transduction by Two-Component Regulatory Systems”  (VSh)  Astrid Fagraeus (A103)

14.45 – 16.45  Laboration:  “Day 2 – dry lab”  (FMa; SFa)  Bacterial strain selection  Laboratory (A109)

Wet-lab discussions of experimental protocols and work flow (FMa; SFa)

Thursday (11-10-2018)

Private study

Friday (12-10-2018)

09.00 – 11.00  Lecture 6:  “Post-transcriptional Regulation”  (JJo)  Astrid Fagraeus (A103)

Lunch

12.00 – 13.00  Lecture 7:  “Translational Regulation”  (JJo)  Astrid Fagraeus (A103)
### Week 42 (working week 3)

#### Monday (15-10-2018)
- **09.00 – 11.00** Lecture 8: “Post-Translational Regulation” (SNw) Astrid Fagraeus (A103)
- Lunch
- **12.00 – 14.00** Lecture 9: “Bacterial Stress – Global Regulation” (VSh) Astrid Fagraeus (A103)

#### Tuesday (16-10-2018)
- **09.00 – 11.30** Lecture 10: “Solute Transport” (MFr) Astrid Fagraeus (A103)
- Lunch
- **12.30 – 14.00** Laboration: “Day 0” Wet lab 1 and Wet lab 2 (FMa; SFa) Laboratory (A109)
- **14.15 – 16.45** Lecture 11: “Protein secretion systems” (MFr) Astrid Fagraeus (A103)

#### Wednesday (17-10-2018)
- **08.45 – 11.00** Laboration: “Day 1 – early” Wet lab 1 and Wet lab 2 “Day 0 – early” Wet lab 3 (FMa; SFa) Laboratory (A109)
- Lunch
- **13.00 – 18.00** Laboration: “Day 1 – late” Wet lab 1 and Wet lab 2 “Day 0 – late” Wet lab 3 (FMa; SFa) Laboratory (A109)

#### Thursday (18-10-2018)
- **10.30 – 12.00** Lecture 12: “Bacterial Motion” (VSh) Astrid Fagraeus (A103)
- Lunch
- **13.00 – 18.00** Laboration: “Day 2” Wet lab 1 and Wet lab 2 “Day 1” Wet lab 3 (FMa; SFa) Laboratory (A109)

#### Friday (19-10-2018)
- **10.00 – 12.00** Lecture 13: “Prokaryotic Differentiation and Development” (SNw) Astrid Fagraeus (A103)
- Lunch
- **13.30 – 15.30** Q&A session: “Tutorial I” (MFr) Astrid Fagraeus (A103)
Week 43

Monday (22-10-2018)
09.00 – 12.00 Lecture 13: “Bacterial Pathogenesis I” (MFr) Astrid Fagraeus (A103)
Private study (eg: preparation for Lab examinations I and II)

Tuesday (23-10-2018)
09.00 – 12.00 Lecture 14: “Bacterial Pathogenesis II” (MFr) Astrid Fagraeus (A103)
Lunch
13.00 – 16.00 Laboration: “Day 0” Wet lab 4 (FMa; SFa) Laboratory (A109)

Wednesday (24-10-2018)
09.00 – 17.30 Laboration: “Day 1” Wet lab 4 (FMa; SFa) Laboratory (A109)

Thursday (25-10-2018)
09.00 – 12.00 Lecture 15: “Bacterial Pathogenesis III” (MFr) Astrid Fagraeus (A103)
Private study (eg: preparation for Lab examinations I and II)

Friday (26-10-2018)
09.00 – 11.30 Lecture 16: “Treatment and Prevention” (MFr) Astrid Fagraeus (A103)
13.00 – 16.30 Laboration: “Day 2” Wet lab 4 (FMa; SFa) Laboratory (A109)
Laboration round-up (FMa; SFa)

Preparation for Lab examinations I and II
(Ensure that your notebook – Lab examination III – is up-to-date and has been signed regularly)
Week 44
(working week 5)

Monday (29-10-2018)
Preparation for group presentation of the laboratory projects
Private study

Tuesday (30-10-2018)

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<tr>
<th>Session 1</th>
<th>Session II</th>
<th>Astrid Fagraeus (A103)</th>
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<tr>
<td>08.30 – 12.30</td>
<td>14.00 – 18.00 (Note: Schedule will follow)</td>
<td>MFr &amp; FMa</td>
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<td>MFr &amp; FMa</td>
<td>MFr &amp; SFa</td>
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Lab examination I “Group presentations - Oral”
Lab examination III “Present your laboratory notebook to MFr”
Mandatory
Individual group examination – Not open to an audience

Private study

Wednesday (31-10-2018)
Private study

16.00
Lab examination II – deadline for “Written Quiz Responses”
(Examinators: FMa; SFa)
Submit electronically to:
firoj.mahmud.umu@analys.urkund.se
farag.salih.ibrahim.umu@analys.urkund.se

Thursday (01-11-2018)
Private study

Friday (02-11-2018)
Private study

14.30 – 16.30 Q&A session: “Tutorial II” (MFr) Astrid Fagraeus (A103)
# Week 45

**Monday (05-11-2018)**

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<tr>
<td>09.00</td>
<td>“Theory Examination”</td>
<td>Lecture hall N320, Naturvetarhuset</td>
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# Week 51

**Monday (10-12-2018)**

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<th>Time</th>
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<tr>
<td>16.00</td>
<td>“Re-Examination”</td>
<td>Östra Paviljongen (room to be decided)</td>
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## Summary of course composition

<table>
<thead>
<tr>
<th>Week 41</th>
<th>Week 42</th>
<th>Week 43</th>
<th>Week 44</th>
<th>Week 45</th>
<th>Week 51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>Tutorial (I)</td>
<td>Tutorial (II)</td>
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<td>Laboratory sessions (in working groups of two)</td>
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<td>Laboratory ‘Round-up’</td>
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<tr>
<td>Laboratory Examination II</td>
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<td>Theory exam (4h)</td>
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<td>Theory Re-exam (4h)</td>
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